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**Notes:**

1. Untranslatable words are replaced with asterisks. (\*\*\*\*).
2. Texts in the figures are not translated and shown as fig.

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Dictionary: Last updated 07/09/2009 / Priority: 1. Chemistry / 2. Medical/Pharmaceutical sciences / 3. Technical term

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**CLAIM + DETAILED DESCRIPTION**

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**[Claim(s)]**

[Claim 1]An emulsifier, a solubilizing agent, or a dispersant in which an average degree of polymerization is a polyglycerin constituent of 3-15, and a total content of the with a carbon numbers of two or more letter structure of branching and a cyclic structure thing generated in connection with polycondensation of glycerol consists of ester of a straight-chain-shape polyglycerin constituent and fatty acid which are 5 or less weight %.

[Claim 2]The emulsifier according to claim 1 which is that in which a straight-chain-shape polyglycerin constituent does not contain said letter structure of branching, and a cyclic structure thing, a solubilizing agent, or a dispersant.

[Claim 3]An emulsifier, a solubilizing agent, or a dispersant given in Claim 1 whose average esterification degrees of ester are 1-4, or 2.

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**[Detailed Description of the Invention]****[0001]**

[Industrial Application]This invention relates to the emulsifier, solubilizing agent, or dispersant which consists of fatty acid ester of the straight-chain-shape polyglycerin constituent which contains in a minute amount the letter structure of branching and cyclic structure thing which carry out subraw in connection with the polycondensation of glycerol, or is not included at all.

**[0002]**

[Description of the Prior Art]A surface active agent is used for changing two or more sorts of substances mutually unmixed generally into uniform status. For example, in mixing the aqueous phase containing the oil phase, the water, and/or the hydrophilic substance containing a hydrophobic substance, it uses an emulsifier and a solubilizing agent. A dispersant may be used when making an oil phase or the aqueous phase distribute fine

particles. The surface active agent which has emulsification, solubilization, or a distributed function in this way is used for various products of broad fields of industry including foodstuffs, cosmetics, drugs, and agricultural chemicals. As a surface active agent, there is a thing of various Mr. Oshi, such as a polyhydric-alcohol-ester derivative, an ether compound, fatty acid soap, an alkyl phosphoric acid derivative, an alkyl-sulfonic-acid derivative, and an amino acid derivative.

[0003]Among these, biodegradability of polyglyceryl fatty acid ester is good, and since there is also no toxicity, in a food field, a cosmetic field, etc., it has been used as a nonionic emulsifier. By changing suitably the distribution of polymerization degree of glycerol, and the esterification degree of fatty acid especially, it is possible to prepare an emulsifier with desired HLB, and the application range is also wide.

[0004]The polyglyceryl fatty acid ester used as a surface active agent is an esterification product of polyglycerin and fatty acid which are usually produced by making heat and carry out the polycondensation reaction of glycerol or the epihalohydrin.

Average degrees of polymerization are [ 2-12, and an average esterification degree ] the things of 1-3.

Therefore, conventional polyglyceryl fatty acid ester is a complicated constituent with the distribution of polymerization degree and esterification degree distribution.

[0005]And since the polyglycerin of a raw material itself is manufactured by said polycondensation reaction, The molecular structure is a thing containing the letter structure of branching and cyclic structure thing accompanying polycondensation of not only a perfect straight-chain-shape structure but a glycerol unit, Even if it is in the polyglyceryl fatty acid ester marketed as a surface active agent, the letter structure of branching and a cyclic structure thing are contained similarly. In the polyglyceryl fatty acid ester generally marketed as a surface active agent, the above mentioned letter of branching and cyclic structure thing usually contain about ten to 70weight %.

[0006]

[Problem to be solved by the invention]Although polyglyceryl fatty acid ester is a good surface active agent and is used abundantly, even if it uses this alone, it is difficult to acquire stable emulsification, solubilization, or a dispersed system over a long period of time. For this reason, it is used combining the surface active agent of other type. Therefore, an object of this invention was to provide the surface active agent which gives stable emulsification, solubilization, or a dispersed system by broad mixed stock.

[0007]

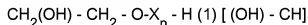
[Means for solving problem]This invention persons found out wholeheartedly that stable emulsification, solubilization, or a dispersed system was realizable by broad mixed stock by using the improved polyglyceryl fatty acid ester as a result of research. This invention was

completed based on this knowledge, and an average degree of polymerization is a polyglycerin constituent of 3-15, And the total content of the with a carbon numbers of two or more letter structure of branching and a cyclic structure thing generated in connection with the polycondensation of glycerol is the emulsifier, solubilizing agent, or dispersant which consists of ester of the straight-chain-shape polyglycerin constituent and fatty acid which are 5 or less weight %.

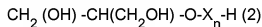
[0008] Let fatty acid ester of the specific polyglycerin constituent described below be an essential ingredient in this invention. That is, the polyglycerin constituent concerning this invention is a polyglycerin constituent of the straight-chain-shape structure as [ which are 3-15 / whose total content of the with a carbon numbers of two or more letter structure of branching and a cyclic structure thing generated in connection with the polycondensation reaction of glycerol is 5 or less weight % ]. This polyglycerin constituent has a straight-chain-shape structure by which the chain of a glycerin skeleton is shown by the following general formula (1) or (2), And as for the total content of two or more letter structures of branching, and cyclic structure things, the carbon number which carries out subraw in connection with the polycondensation reaction of the unit of a glycerin skeleton occupies 5 or less weight % of the whole polyglycerin constituent.

[0009]

[Chemical formula 1]



[Chemical formula 2]



[ -- however -- in a formula (1) and (2) -- X - it is either  $\text{CH}_2 - \text{CH}(\text{OH}) - \text{CH}_2 - \text{O}-$  or  $-\text{CH}_2\text{CH}(\text{CH}_2\text{OH}) - \text{O}-$ , and n is 2-14. ]

[0010] On the other hand, carbon numbers are 2-22 and fatty acid concerning this invention is saturation or unsaturated straight chain shape or letter fatty acid of branching. As this example, acetic acid, lactic acid, caproic acid, caprylic acid, capric acid, 2-ethylhexanoic acid, nonanoic acid, lauric acid, myristic acid, pentadecanoic acid, Palmitic acid, palmitoleic acid, stearic acid, oleic acid, elaidic acid, Linolic acid, alpha- and gamma-linolenic acid, 2-heptylundecanoic acid, Isostearic acid, recinoleic acid, 10-hydroxy stearic acid, 10-keto stearic acid, 12-hydroxy stearic acid, behenic acid, erucic acid, arachidonic acid, eicosapentaenoic acid, docosahexaenoic acid, etc. are raised.

[0011] Hydrolysis mixing fatty acid of these judgment fats and oils and hydrogenate oil and fat, such as cocoanut oil, cacao butter, palm oil, soybean oil, oleum rapae, cotton seed oil, corn oil, the linseed oil, castor oil, safflower oil, sunflower oil, sesame oil, arachis oil, olive oil, lard, beef tallow, and fish oil, can also be used. Among these fatty acid, caprylic acid, capric acid, 2-

ethylhexanoic acid, Lauric acid, palmitic acid, stearic acid, oleic acid, linolic acid, isostearic acid, recinoleic acid, 12-hydroxy stearic acid, behenic acid and cocoanut oil, soybean oil, oleum rapae, the linseed oil, beef tallow, and hydrolysis mixing fatty acid of hardened fish oil are preferred.

[0012][ the polyglyceryl fatty acid ester used for this invention ] . [ remove / the ester which has a letter of branching and an annular polyglycerin structure after carrying out ester synthesis of the polyglycerin constituent and fatty acid which contain the letter of branching and cyclic structure with a straight-chain-shape structure ] The polyglycerin constituent of the straight-chain-shape structure which does not contain polyglycerin of the letter of branching and cyclic structure can be obtained by the ability to compound fatty acid ester in it in a raw material.

[0013]A polyglycerin constituent heats and carries out the polycondensation reaction of glycerol, glycidol, or the epichlorohydrin, for example, and is obtained, The esterification reaction of the fatty acid ester of this may be carried out to free fatty acid under acidity or existence of a metal catalyst, a direct reaction may be carried out to a fatty acid anhydride or a fatty acid chloride, or an ester exchange reaction may be carried out to fatty acid methyl ester under existence of metal alcoholate or lipase. Although it is possible to be based on distillation and/or chromatography as a refining process for removing the letter of branching and an annular polyglycerin component, distillation is not suitable for refining of a high-polymer thing. As chromatography, techniques, such as gel filtration, distribution, adsorption, and ion exchange, are raised.

[0014][ the polyglyceryl fatty acid ester used by this invention obtained in this way ] an average degree of polymerization -- 3-15 -- it being a polyglycerin constituent of 4-10 preferably, and, The total content of the with a carbon numbers of two or more letter structure of branching and a cyclic structure thing accompanying the polycondensation of glycerol And 5 or less weight %, 3% or less of the straight-chain-shape polyglycerin constituent which does not contain said letter of branching and a cyclic structure thing still more desirably and said fatty acid set to an average esterification degree preferably -- 1-4 -- it is preferably esterified by 1-3.

[0015]In this polyglyceryl fatty acid ester, if the total content of said letter of branching and a cyclic structure thing exceeds 5 weight % or an average esterification degree separates from the range of 1-4, the emulsifier, solubilizing agent, or dispersant which gives the stable homogeneous-mixing system which this invention makes the purpose cannot be obtained.

[0016]Since polyglyceryl fatty acid ester of this invention is excellent in the emulsification, solubilization, or the distributed function as a surface active agent, it can use this independently. In this case, although the amount of addition changes with subjects to blend, generally it is preferably used 0.1 to 30weight % in the amount of addition of 0.5 to 15weight % of the range. When it uses together with other various surface active agents, the total amount of the whole surface active agent blended with the amount of other surface active agents used

can be reduced. As a surface active agent which can be used together, a polyhydric-alcohol-ester derivative, an ether compound, fatty acid soap, an alkyl phosphoric acid derivative, an alkyl-sulfonic-acid derivative, an amino acid derivative, etc. are raised as an example. Although the example of manufacture and an embodiment are shown below, these do not limit the embodiment of this invention.

[0017]

[Working example]

The polyglycerin constituent of marketing which used example epichlorohydrin of manufacture as the raw material, made carry out a polycondensation reaction, and was obtained was covered over the gel filtration chromatography which made water the eluate, and fractionation was carried out to polyglycerin of each degree of polymerization. After acetylating each fraction furthermore, flash chromatography refined 4 times by the hexane eluate, and the letter type of an annular type and branching and each straight-chain-shape type polyglycerin acetate were obtained. After carrying out saponification decomposition in a sodium hydroxide aqueous solution, the polyglycerin in which removes an alkali, it desalts and dries [ dehydration ] with an ion exchange resin, and not less than 95% of purity corresponds respectively was obtained. Collect refining polyglycerin of each mold and an average degree of polymerization is set to 6 or 10, [ by esterifying weight with weight at 40-50 \*\* by making 1 weight % of lipase into a catalyst by 1 mol each for 20 hours by 1 mol of stearic acid, or 2 mol of oleic acid ] A straight-chain-shape type, the letter type of branching and annular type hexa, deca glycerol monostearate, or the dioleate was prepared. Yield of this esterification material: It was acid number:0.1-0.5 and hydroxyl value:320-610 90 to 95%.

[0018]Embodiment 1 emulsification test: Casein sodium was dissolved in distilled water, it was considered as the aqueous phase, the polyglyceryl fatty acid ester obtained in marketing and the example of manufacture was mixed to liquid paraffin, and it was considered as the oil phase. The aqueous phase and an oil phase were mixed and it was made to emulsify for 5 minutes at 1500 rpm using a homogenizer. Aging of the emulsified state of each emulsified matter was shown in table-1. Table -Straight-chain-shape type polyglyceryl fatty acid ester of this invention shows the outstanding emulsification ability so that clearly from 1.

[0019]

[Table 1]

表-1 乳化物の安定性

実験No.			1-1	1-2	1-3	1-4	1-5	1-6
カゼインナトリウム			0.5	1	0.5	0.5	0.5	0.5
蒸留水			100	100	100	100	100	100
流動パラフィン			100	100	100	100	100	100
市販デカグリセリン モノステアラート					0.5			
直鎖状型デカグリセリンモノ ステアラート (本発明品)						0.5		
環状型デカグリセリン モノステアラート							0.5	
分枝状型デカグリセリン モノステアラート								0.5
乳 化 状 態 ／ 各 相 の 容 積 %	直後	水 相	0	0	0	0	0	0
		乳化相	100	100	100	100	100	100
		油 相	0	0	0	0	0	0
	1時 間後	水 相	5.5	2.4	0.9	0	1.9	0
		乳化相	94.5	97.6	99.1	100	98.1	100
		油 相	0	0	0	0	0	0
	1週 間後	水 相	36.3	19.9	9.2	1.1	12.3	7.2
		乳化相	63.7	80.1	90.8	98.9	87.7	92.8
		油 相	0	0	0	0	0	0
	1カ 月後	水 相	36.2	20.2	14.9	2.5	17.9	9.5
		乳化相	63.8	79.8	85.1	97.5	82.1	90.5
		油 相	0	0	0	0	0	0

The unit of a notes combination component: As for distilled water and liquid paraffin, ml and others are g. [0020]Embodiment 2 solubilization examination: The polyglyceryl fatty acid ester obtained to tocopherol in cane sugar monostearin acid ester, glycerol, and the example of manufacture was added, these were dissolved in ethanol, and it was considered as the sample. Distilled water was added stirring this sample and the amount of water which can solubilize this sample was measured. The result was shown in table-2. Straight-chain-shape type polyglyceryl fatty acid ester of this invention shows the outstanding solubilization ability. [0021]

[Table 2]

表-2 水の可溶化量

実験No.	2-1	2-2	2-3	2-4	2-5	2-6
トコフェロール	1	1	1	1	1	1
ショ糖モノステアリン酸 エステル	4	4	4	4	4	4
エタノール	10	10	10	10	10	10
グリセリン		1	4			
環状型ヘキサグリセリン モノステアレート				4		
分枝状型ヘキサグリセ リンモノステアレート					4	
直鎖状型ヘキサグリセ リンモノステアレート (本発明品)						4
蒸留水 (ml)	27	30	150	155	140	184

The unit of notes each combination component: g [0022] Embodiment 3 dispersibility examination: Ether was distilled off and the sample was prepared, after dissolving the polyglyceryl fatty acid ester obtained in lecithin, POE (20) sorbitan stearate, and the example of manufacture in twice [ 10 weight ] as many ether as this and distributing titanium oxide. Liquid paraffin was made to distribute this sample and aging of that status was investigated. The result was shown in table-3. What added straight-chain-shape type polyglyceryl fatty acid ester of this invention maintained the good dispersion state.

[0023]

[Table 3]

表-3 分散物の安定性

実験No.		3-1	3-2	3-3	3-4	3-5	3-6
水添大豆レシチン		10	10	10	10	10	10
P. O. E(20) ソルビタン							
ステアレート		15	20	15	15	15	15
環状型ヘキサグリセリン							
ジオレエート				5			1
分枝状型ヘキサグリセ							
リンジオレエート					5		1
直鎖状型ヘキサグリセ							
リンジオレエート						5	2
(本発明品)							
酸化チタン		1	1	1	1	1	1
流動パラフィン		50	50	50	50	50	50
分散 状態	分散時	△	△	○	○	○	○
	5分後	△	△	△	△	○	○
	1日後	×	×	△	×	○	○
	1週間後	×	×	×	×	○	△

Evaluation of the unit:g dispersion state which is notes each combination component: O (fitness), \*\* (it dissociates a part), x (separation)

[0024]

[Effect of the Invention]Polyglyceryl fatty acid ester of this invention has the outstanding emulsification, solubilization, or a distributed function.

Since the operation which stabilizes various interfaces is demonstrated, a stable emulsified matter, a meltable ghost, or a distributed thing can be obtained.

Since it is avirulence, it can use for foodstuffs, cosmetics, external preparations, drugs, etc.

[Translation done.]